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The structure of the oxygen-annealed $Fe_{1.08}Te_{0.55}Se_{0.45}O_x$ superconductor HEFEI HU, JIANMIN ZUO, MAO ZHENG, JAMES N. ECKSTEIN, WAN KYU PARK, LAURA H. GREENE, University of Illinois at Urbana-Champaign, JINSHENG WEN, ZHIJUN XU, ZHIWEI LIN, QIANG LI, GENDA GU, Brookhaven National Laboratory — Effect of oxygen annealing on the iron chalcogenide superconductor with excess Fe is studied and structure change is investigated by using electron microscopy. The as-grown single crystal $Fe_{1.08}Te_{0.55}Se_{0.45}$ with the tetragonal PbO-type structure is non-superconducting owing to the excess Fe. Superconductivity is induced after oxygen annealing with an onset and zero resistance transition temperature around 14.5 K and 11.5 K, respectively. The oxygen doping is evidenced by electron energy loss spectroscopy, and accompanied by improved homogeneity in the remaining PbO-type phase as well as an increase in the L_3/L_2 intensity ratio of the Fe-$L_{2,3}$ edge, indicating an increase in Fe valence. Local phase transformation from the tetragonal PbO-type phase to the hexagonal NiAs-type phase is also observed after oxygen annealing.

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